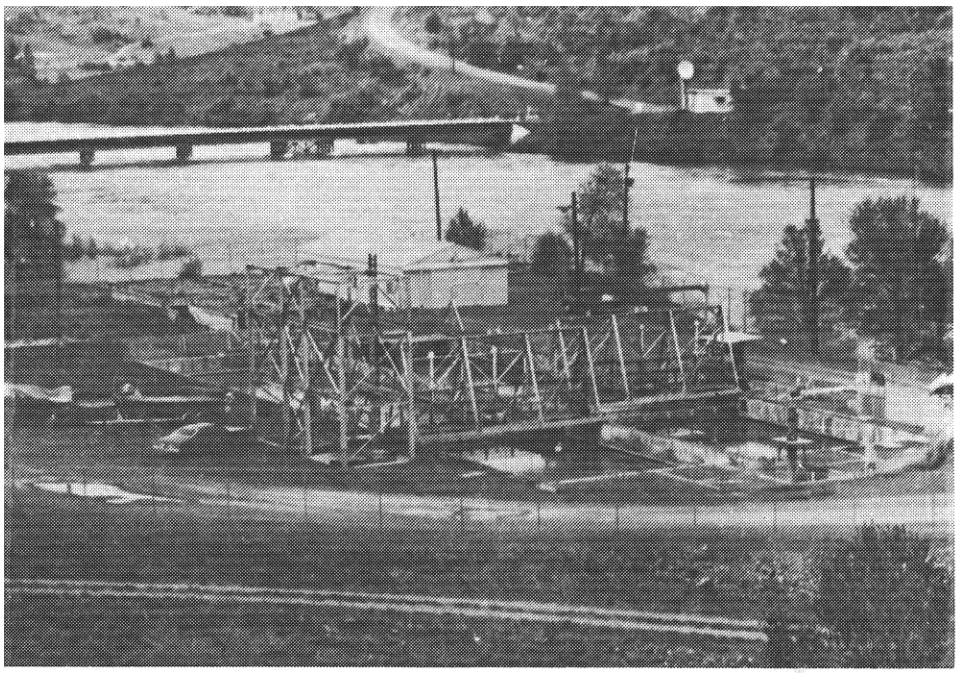
OXBOW FISH HATCHERY

1997 Steelhead Brood Year Report
1996 Spring Chinook Brood Year Report



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ABSTRACT

For brood year 1998, the steelhead trout *Oncorhynchus mykiss* run totaled 1,270 fish entering the Hells Canyon Dam fish trap. Fall trapping (October 28, 1996 to December 11, 1996) collected all 1,270 fish. Of these fish, 567 were males and 703 were females. Due to major flood damage to the trap and extremely high water, the trap was not operated during the spring of 1997.

Age-class breakdown of the run was 753 one-ocean fish and 517 two-ocean fish. There were no wild steelhead trapped this season. There were 157 marked fish collected: 149 coded-wire tags (CWT) and eight with various other jaw tags, or floy tags.

A total of 365 surplus adult steelhead were released into Hells Canyon Reservoir(181), the Payette River (50), the Boise River (131) and the Morrison-Knudsen Nature Center pond (3) during the fall of 1996. An additional 62 escaped into Hells Canyon Reservoir during the January 1997 floods.

No fall chinook salmon *O. tshawytscha* were incidentally trapped during the fall steelhead trapping this year.

Pre-spawning mortality totaled 220 steelhead adults (24.44%). Spawning consisted of 14 egg takes from March 17 until May 1, 1997. A total of 301 females were spawned with an average fecundity of 5,260 eggs per female. These fish produced 1,583,235 green eggs. The percent eye-up was 80.31%, leaving a total of 1,271,524 eyed eggs.

Niagara Springs Hatchery received 701,272 eyed eggs during May, and 549,154 swim-up fry in July 1997.

During the spring of 1998, 653276 steelhead smolts were transported from Niagara Springs Hatchery and were released below Hells Canyon Dam.

For brood year 1996, spring chinook salmon were trapped from May 17 to July 18, 1996. The run totaled 78 fish: 54 jacks, 19 two-ocean fish, and 5 three-ocean fish. A total of 62 fish (51 males, 11 females) were transferred to Rapid River Hatchery.

Prespawning mortalitiy totaled two salmon while on station and four mortalities after transfer to Rapid River Hatchery. Eleven females were spawned for a total of 39,171 green eggs. Eye-up was 93.3% for 36,547 eyed-eggs.

A total of 304,096 spring chinook salmon smolts from Clearwater Hatchery were released during the spring of 1998. These smolts were all marked with an adipose fin (AD) clip.

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1997 STEELHEAD BROOD YEAR REPORT

INTRODUCTION

Oxbow Fish Hatchery (OFH) is part of the Idaho Power Company's (IPC) hatchery system and has been in operation since 1962. The OFH facility is owned and funded by IPC and operated by the Idaho Department of Fish and Game (Department). The hatchery is located on the Oregon shore of the Snake River at mile marker 270, approximately one-quarter mile below IPC's Oxbow Hydroelectric Plant. The OFH is a steelhead trout *Oncorhynchus mykiss* and spring chinook salmon *O. tshawytscha* adult holding and egg taking station.

OBJECTIVES

The primary purpose of OFH is to trap enough returning adult steelhead and spring chinook to meet the Hells Canyon mitigation requirements for adult anadromous fish returns to the Upper Snake River. The mitigation goal is to produce 400,000 lbs of steelhead smolts at Niagara Springs Fish Hatchery. The OFH goal is to produce 1.3 million eyed steelhead trout eggs. The OFH also traps spring chinook that are transferred to Rapid River Fish Hatchery for spawning.

Facility Description

The OFH consists of a main hatchery building, four adult holding ponds, two incubation water-chilling units, an off-station fish trap, and a single-family residence. The facility has six cinder block raceways that have decayed beyond repair.

The hatchery building is a 28 ft x 60 ft, single-story metal structure partitioned into two main rooms. Half of the building consists of shop space, office space, and sleeping quarters, while the other half is for egg incubation. Two eight-ft square sheds attached to the main building provide storage.

The incubation room has the capacity to eye-up 3.4 million eggs. The 24 incubation stacks provide the hatchery with 384 incubation trays (FAL and Heath trays).

The chiller refrigeration unit is enclosed in a 12 ft x 17 ft metal building to the side of the hatchery building. The chiller has the capacity to chill 120 gallons per minute (gpm) of water to 40^{o}F.

Adult holding and production facilities include four holding ponds, a fish trap, and a fish transport truck. The four holding ponds are actually two large ponds separated into four sections. The two larger divisions each measure 105 ft x 30 ft x 5 ft, providing 31,500 cubic feet (cf) of holding area. The two smaller divisions measure 55 ft x 30 ft x 5 ft, providing 16,500 cf of holding space. Two electric crowding racks provide the ability to consolidate the fish for handling. Six outside raceways (3 ft x 6 ft x 100 ft) could provide 10,800 cf of rearing space after reparations. The adult fish trap consists of an attraction pool, the fish ladder, two weirs, a fish trap, and a loading hopper. The fish are removed from the trap when the loading hopper is hoisted 80 feet to

the fish transport truck. The fish truck is a 1981 GMC 2.5-ton, 10-wheel truck with a bed-mounted 1,000-gallon fish tank. Up to 100 fish are then transported 23 miles to OFH.

Water Supply

The Snake River provides most of the water for hatchery operations. A pumping platform next to the hatchery holds two production pumps. These production pumps (100-hp each) produce 20 cf per second (cfs). Only one pump operates at a time. The other pump acts as an emergency backup and has a separate power source. Water temperatures range from a winter low of 34°F to a late summer high of 72°F. Water from the production pumps passes through two aeration pump platforms before entering the four holding ponds.

Two wells provide the water for steelhead egg incubation. One well serves as a primary water source, while the other is an emergency backup with a separate power source. The primary well water was a constant 52°F, while the backup was a constant 54°F. Both wells pump a maximum of 120 gpm. Incubation water enters an elevated surge tank in the hatchery building before distribution through two 4-inch PVC water lines to the 24 incubator stacks.

Staffing

The OFH is staffed by one permanent Fish Hatchery Assistant Manager. Two temporary Bio-aides and two laborer positions share the 2,400 hours budgeted for extra help.

Adult Collection

Fall trapping for steelhead started on October 28, 1996 and ended on December 11, 1996 capturing a total of 1,270 steelhead (Figure 1). Due to major flood damage and high water flows, the trap was not operated during the spring. The 1997 brood year steelhead run of 1,270 fish comprised of 567 females and 703 males. The brood stock strategy of 1,200 fish, one fourth of the egg take being from spring-run fish was met this year.

All trapped steelhead trout were measured for fork length to the nearest centimeter. This procedure allowed for the age-class designation of one-ocean steelhead being male fish less than 68 cm and those female fish less than 66 cm. Using these criteria, 753 steelhead were one-ocean and 517 steelhead were two-ocean (Figure 2).

Adult fish releases during the fall totaled 365 surplus adults consisting of 200 females and 165 males. A total of 181 were released into Hells Canyon Reservoir at OFH, 131 fish released into the Boise River, 50 into the Payette River, and 3 into the Morrison-Knudsen Nature Center pond. During the flood in January 1997, 62 steelhead (18 males, 44 females) escaped from the ponds into Hells Canyon Reservoir. An additional 19 surplus spawners (11 males, eight females) were released into Hells Canyon Reservoir in May 1997.

Tag Recovery

This season, 157 steelhead trout were captured with some form of mark or tag. There were 149 fish with coded-wire-tag, one jaw tag, and seven fish with floy tags. The tagging agencies included the National Marine Fisheries Service, the University of Idaho, Oregon Department of Fish and Wildlife, and the Idaho Department of Fish and Game. Snouts from the coded-wire tagged fish were transported along with all jaw and floy tags to the Lewiston Tag Recover Laboratory.

Of the 1,270steelhead captured, none were wild or natural fish. Wild or natural steelhead are identified by having an AD and the remaining fins not eroded. All wild fish are returned to the Snake River below Hells Canyon Dam.

Incidental Capture of Fish

The fall trapping effort resulted in the capture of no fall chinook salmon.

Holding and Spawning

Prespawning Mortality

Pre-spawning mortality consisted of all female steelhead that died before spawning and those male steelhead that died up to two weeks after the first spawning date (March 31, 1997). Pre-spawning mortality was 220 fish (24.44%) comprised 95 males and 125 females. Poor water conditions during the January 1997 flood contributed to the mortality. There were two trap mortalities, and three fish sacrificed for disease sampling not included in the totals.

Spawning Operations

Steelhead trout spawning operation began on March17 and ended on May 1, 1997. Females were sorted twice weekly for ripeness. Ripe females were killed with a blow to their head. Females were dry-spawned by incision, and the eggs collected in a colander to drain the ovarian fluid. Eggs from each female were placed into a spawning bucket, then fertilized with sperm from one male. The fertilized eggs from two females were poured together and remained in one cup of well water for up to five minutes to activate sperm. The fertilized eggs were water-hardened in a minimum of 100 ppm buffered Argentyne for one hour. Ovarian fluid samples were collected from 150 spawned females for viral assay. The eggs were loaded into the incubator trays with two families per tray, maintaining the integrity of the disease samples.

Twenty-two females steelhead trout were killed for spawning, but their eggs were culled due to abnormal appearance of eggs or internal organs.

Incubation

Fourteen egg takes produced 1,583,235 green eggs from 301 females for a fecundity of 5,260 eggs per female (Table 1). The percent eye-up was 80.31% for 1,271,524-eyed eggs. Egg numbers were determined by enumeration of eyed eggs with a Jensorter brand Model JH egg sorter with electronic counter.

After the first two days of incubation, daily 15-minute drip treatments of 1,667-ppm formalin were used to prevent fungus. Incubator water flows were maintained at 5 gpm. Eggs eyed-up after 350 temperature units in the 40°F well water. Eyed eggs were shocked by pouring a tray of eggs into a bucket half-full of water and pouring them back into the egg tray.

Egg Shipments

Eyed eggs were transferred to Niagara Springs Hatchery (701,272 from 11 lots) and transported in 48-quart coolers with iced well water.

Fry Shipments

A total of 549,154 swim up fry were transported to Niagara Springs Hatchery during July. These were reared in chilled 42°F water to delay their shipping. These fry were transferred from their incubation trays into several stainless steel tubes for transport. Eggs from two or three trays were poured into the transport tube. These tubes were then placed in the bottom of a 2-ton fish truck filled with chilled water, and transported to Niagara Springs. These fry came from the first three egg takes (Table 2).

Carcass Disposition

Hatchery employees checked all carcasses for coded-wire tags, other tags, and signs of bacteria, and other diseases. The fish carcasses were taken to the Halfway Landfill for burial.

Steelhead Smolt Releases

The 1997 brood year steelhead trout smolts were released in the spring of 1998. A total of 653,276 steelhead smolts averaging 4.81/lb (135,825 lbs) were released into the Snake River below Hells Canyon Dam. Niagara Springs Hatchery reared these smolts. For more information, see their annual report.

1997 SPRING CHINOOK BROOD YEAR REPORT

Spring Chinook Trapping

Spring chinook salmon returning to the Hells Canyon trap in 1996 were from smolt releases in 1993, 1994, and 1995 (Table 3).

Spring chinook salmon trapping began May 15, 1996 and ended July 18, 1996 (Figure 3). The trap was shut down from May 29 through June 17, 1996 due to high water flows. A total of 78 salmon (60 hatchery, 18 wild) were trapped. The run consisted of 54 jacks, 11 males, and 13 females; the hatchery run comprised 46 jacks, 6 males, and 8 females, while the wild run made up 8 jacks, 5 males and 5 females. The Hells Canyon salmon hatchery run comprised 46 one-ocean fish, 13 two-ocean fish, and one three-ocean fish. The wild fish run comprised 8 one-ocean fish, 6 two-ocean fish, and 4 three-ocean fish. A fork length of $\leq$53 cm denoted one-ocean fish, 54-80 cm defined two-ocean fish, and $\geq$81 cm designated three-ocean fish (Figure 4).

Holding and Spawning

Adult Treatments

Erythromycin 100 injections were given to adult salmon while held at OFH according to Investigational New Animal Drug (INAD) protocol. All hatchery chinook and three wild chinook that were trapped and released three times were injected at one dosage rate before transfer to Rapid River Hatchery. A total of 64 fish received 20-mg/kg and were marked with an opercle tag made out of Tyvex material. There was one holding pond mortality and the remaining 63 chinook were transported to Rapid River Hatchery. These fish were hauled at the end of each week. Adding 44 blocks of ice chilled the water in the transport truck. In addition, 33 grams of MS222 was added to reduce fish stress during transport.

Prespawning Mortality

Pre-spawning mortality for 1996 spring chinook was seven fish. There was one trapping mortality (one female) and one salmon (one adult male) died in the holding ponds at OFH. Of the fish transferred to Rapid River Hatchery, the pre-spawn mortality was 6.4 percent. This totaled four salmon (three jacks and one adult male). Most of the mortalities were attributed to fungus and nitrogen blistering.

Spawning Operations

Hells Canyon trapped fish were combined with Rapid River's broodstock this year. All numbers were calculated using a percentage of the totals from Rapid River Hatchery. A total of 11 female Hells Canyon chinook salmon were spawned with the average fecundity of 3,561 eggs per female. These fish produced 39,171 green eggs. The percent eye-up was 93.3%, leaving 36,547 eyed eggs.

Chinook Smolt Releases

Brood year 1996 spring chinook salmon releases were conducted in the spring of 1998. These smolts were from Rapid River/Hells Canyon brood stock reared at Clearwater Hatchery. A total of 304,096 smolts were released into the Snake River below Hells Canyon Dam. These smolts were marked with an AD clip before their release. See Rapid River and Clearwater hatcheries annual reports for more information.

HATCHERY IMPROVEMENTS

Idaho Power's Oxbow maintenance personnel were responsible for the work related to many hatchery improvements. The major improvements included:

- Fabrication of visitor information signs.
- Alteration of the fish trap to eliminate stranding fish in the hopper holding area
- Installation of safety fencing and grating around various hazards
- Upgrading the crowding system and installing walkways in the holding ponds to improve employee safety

A major purchase for OFH was a chilling unit for the incubation water system. Its installation will enable the hatchery to adjust the development rate of eggs. Slowing the egg development will delay feeding and will help ensure the correct size at release without holding the fingerlings off feed at final rearing facilities.

Another purchase consisted of 12 eight-tray FAL incubator stacks to replace the remainder of the old stacks. Other purchases included a Micron Millennia personal computer with an HP Laser Jet 5L printer and the requisite software, an Amana microwave for the dorm, and a Hoshizaki ice maker for adult and egg shipments.

HATCHERY RECOMMENDATIONS

The holding ponds need to be modified to create a better holding environment and to reduce fish stress and injuries during routine handling. Efforts should also be made to improve the water quality entering the holding ponds.

Another priority should be the renovation of the hatchery building. The incubation room needs waterproof paneling, adequate lighting, a heat source, and additional electrical outlets. The office space needs to be enlarged and arranged to provide a view of the fish holding ponds for fish monitoring and visitor safety. The dormitory needs major renovation, as it is currently inadequate for temporary employee housing.

The hatchery alarm system should be modified to sense the holding pond water level directly and to be able to register more than one alarm signal at any given time. An alarm system and an automatic switch over needs to be installed at the trap to facilitate running the trap for 24 hours at a time.

TABLES

Table 1. Summary of steelhead spawning at Oxbow Fish Hatchery, 1998.

Lot #	Spawn Date	Number Females	Green Eggs	Eyed Eggs	Percent Eye-up	Eggs/ Female
1	03/17/97	51	276,379	223,735	80.95	5,419
2	03/20/97	24	127,702	108,545	84.99	5,321
3	03/24/97	54	300,561	237,972	79.18	5,566
4	03/27/97	28	147,706	110,461	74.78	5,275
5	03/31/97	52	320,068	281,691	88.01	6,155
6	04/03/97	20	82,041	61,894	75.44	4,102
7	04/06/97	36	144,358	112,475	77.91	4,010
8	04/10/97	16	77,585	57,956	74.7	4,849
9	04/14/97	5	24,399	21,121	86.57	4,880
10	04/17/97	2	11,573	10,072	87.03	5,787
11	04/21/97	6	26,435	17,614	66.63	4,406
12	04/24/97	2	9,509	3,113	32.74	4,755
13	04/28/97	5	24,563	16,304	66.38	4,913
14	05/01/97	2	10,356	8,571	82.76	5,178
TOTAL		**301**	**1,583,235**	**1,271,524**	**80.31**	**5,260**

Table 2. Disposition of Oxbow Fish Hatchery steelhead eggs, 1997.

1,583,235	green eggs
311,711	pick off - eggs (80.31% eye-up)
1,271,524	eyed eggs
64,999	culled eggs
701,272	eyed eggs shipped to Niagara Springs (lots 4-14)
21,098	pick off - fry (77.93% of green to swim-up
0	culled fry
549,154	swim up fry shipped to Niagara Springs (lots 1-3)

Table 3. Spring chinook releases and returns, BY97.

Release Year	Smolts Released	Hatchery Returns by Release yr	Previous Returns
1993	200,300	1	21
1994	380,504	13	1
1995	499,986	46	0
Totals	**1,080,790**	**60**	**22**

FIGURES

Figure 1. Steelhead run timing at Oxbow Fish Hatchery, BY97.

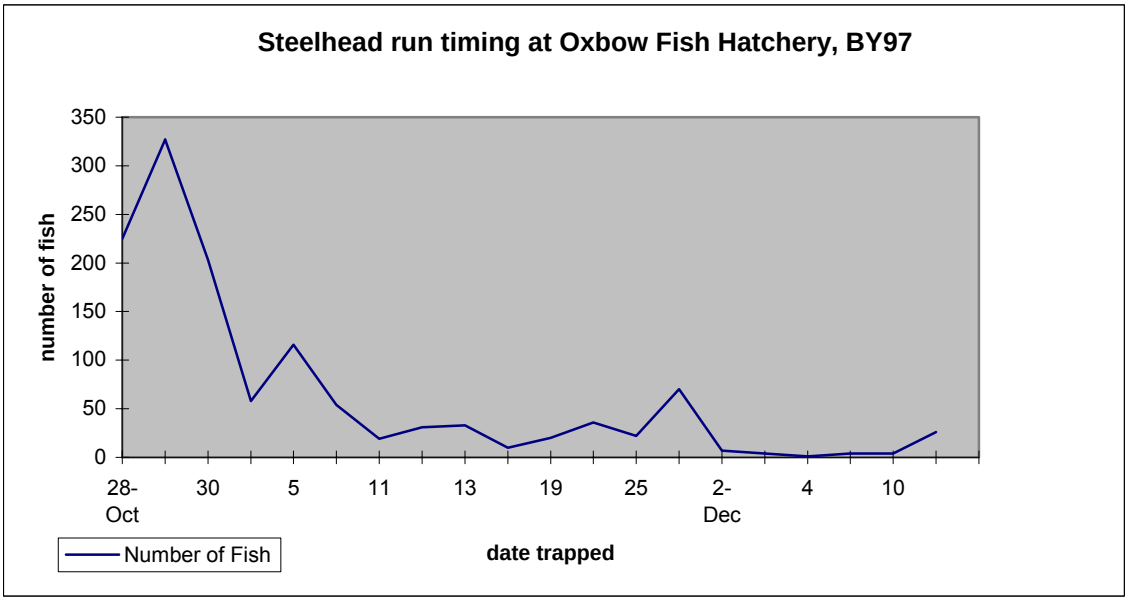


Figure 2. Oxbow Fish Hatchery steelhead length frequencies, BY97.

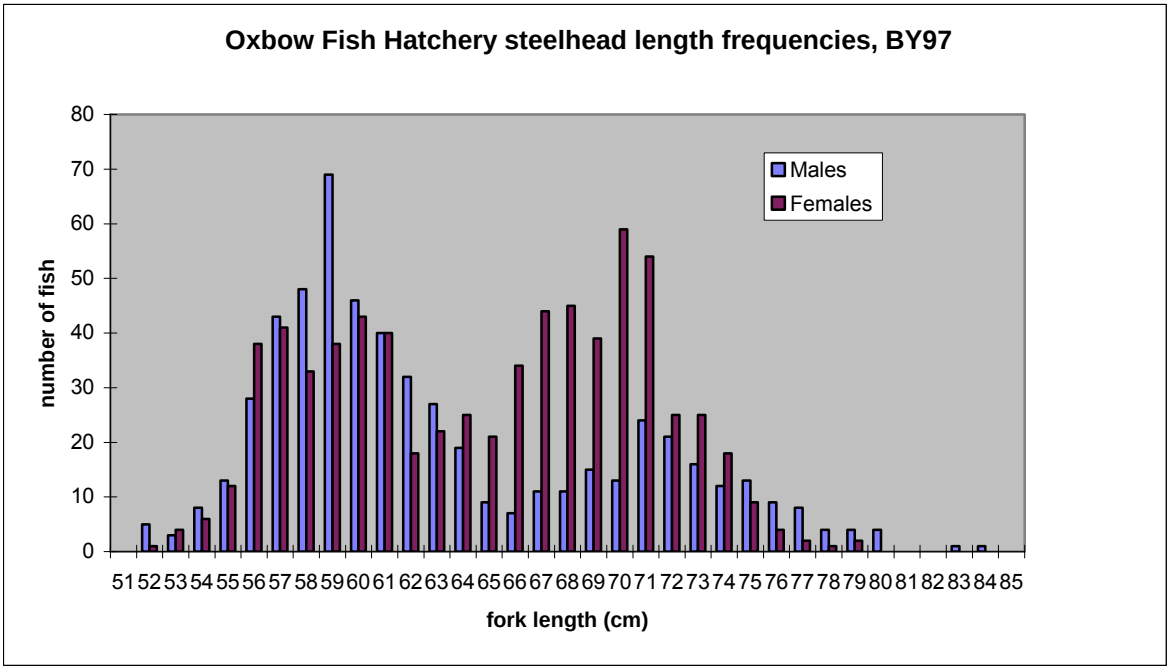


Figure 3. Spring chinook run timing at Oxbow Fish Hatchery, BY96.

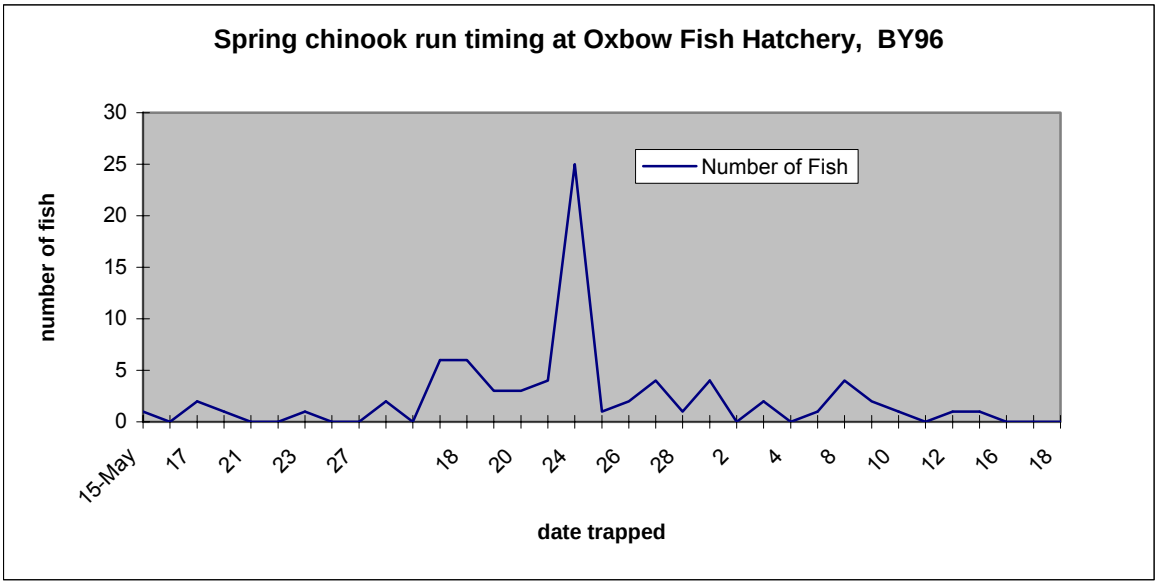
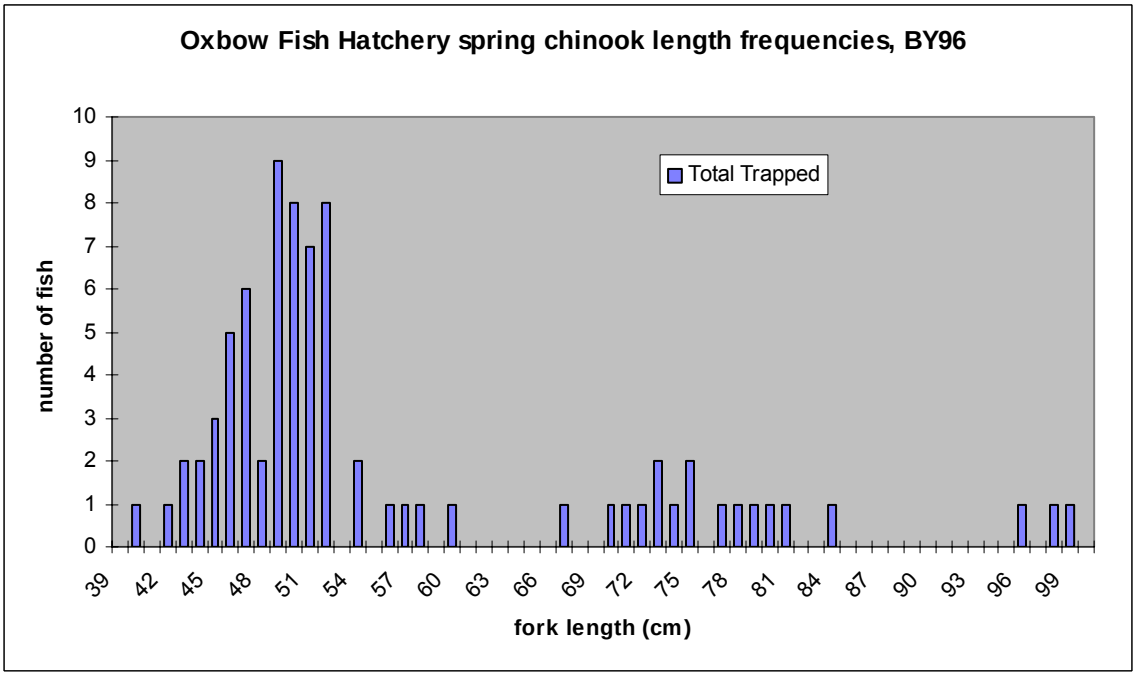


Figure 4. Oxbow Fish Hatchery spring chinook length frequencies, BY96.



APPENDICES

Appendix A. Run timing of steelhead trapped at Hells Canyon FOR Oxbow Fish Hatchery, Fall 1996.

Month/Date Trapped	Number of Fish
28-Oct	225
29	327
30	203
4-Nov	58
5	116
6	54
11	19
12	31
13	33
18	10
19	20
20	36
25	22
26	70
2-Dec	7
3	4
4	1
9	4
10	4
11	26
TOTAL	**1,270**

Appendix B. Fork length (cm) frequency of steelhead FOR Oxbow Fish Hatchery, 1997.

cm	Totals	Males	Females	Inches
51				20.1
52	6	5	1	20.5
53	7	3	4	20.9
54	14	8	6	21.3
55	28	16	12	21.7
56	66	28	38	22.0
57	84	43	41	22.4
58	81	48	33	22.8
59	107	69	38	23.2
60	89	46	43	23.6
61	80	40	40	24.0
62	50	32	18	24.4
63	49	27	22	24.8
64	44	19	25	25.2
65	30	9	21	25.6
66	41	7	34	26.0
67	55	11	44	26.4
68	56	11	45	26.8
69	54	15	39	27.2
70	72	13	59	27.6
71	78	24	54	28.0
72	46	21	25	28.3
73	41	16	25	28.7
74	30	12	18	29.1
75	22	13	9	29.5
76	13	9	4	29.9
77	10	8	2	30.3
78	5	4	1	30.7
79	6	4	2	31.1
80	4	4		31.5
81				31.9
82				32.3
83	1	1		32.7
84	1	1		33.1
Total	**1,270**	**567**	**703**	

Age-class	Male	Female	Total	Average Length
One-ocean	411	342	753	59.1
Two-ocean	156	361	517	70.8
Total	567	703	1270	63.88

Age Class Breakdown:

One-ocean (males <68cm, females <66cm)

Two-ocean (males >68cm, females >66cm)

Appendix C. Length frequency (cm) of spring chinook for Oxbow Fish Hatchery, 1996.

Length cm	3-Y-olds		4-Y-olds		5-Y-olds		Total
	Hat	Wild	Hat	Wild	Hat	Wild	
40		1					1
41							0
42	1						1
43	2						2
44	2						2
45	3						3
46	5						5
47	5	1					6
48	2						2
49	7	2					9
50	6	2					8
51	5	2					7
52	8						8
53							0
54			2				2
55							0
56			1	1			2
57			1				1
58			1				1
59							0
60			1				1
61							0
67*			1				1
68							0
69							0
70			1				1
71				1			1
72			1				1
73			2				2
74			1				1
75			1	1			2
76							0
77				1			1
78				1			1
79				1			1
80			1				1
81						1	1
82							0
83							0
84						1	1
85							0
96*						1	1
97							0
98					1		1
99						1	1
Total	**46**	**8**	**13**	**6**	**1**	**4**	**78**

Age-class	Total	Average Length
One-ocean	54	48.39
Two-ocean	19	68.58
Three-Ocean	5	91.6
Total	**78**	**56.08**

Age Class Breakdown:

One-Ocean	(3-yr-olds, ≤53 cm)
Two-Ocean	(4-yr-olds, 54-80 cm)
Three-Ocean	(5-yr-olds, 81 cm)

Appendix D. Spring chinook run timing at Oxbow Fish Hatchery, 1997.

MONTH/DATE TRAPPED	NUMBER OF FISH	MONTH/DATE TRAPPED	NUMBER OF FISH
15-May	1	26-Jun	2
16		27	4
17	2	28	1
20	1	1-Jul	4
21		2	
22		3	2
23	1	4	
24		5	1
27		8	4
28	2	9	2
17-Jun	6	10	1
18	6	11	
19	3	12	1
20	3	15	1
21	4	16	
24	25	17	
25	1	18	
		TOTAL	**78**

Appendix E. Oxbow Fish Hatchery, fish trapping summary and breakdown.

STEELHEAD BROOD YEAR 1998

Fish Trapped	
Males	567
Females	703
Total	**1,270**

Age Class Breakdown	
1 Ocean	753
2 Ocean	517
Total	**1,270**

Fish Disposition	Males	Females	Total
Pre-spawn Mortality	95	125	220
Trap & Sample Morts	2	3	5
Spawned only	275	301	576
Released **	195	252	447
Killed but not used		22	22
Total	**567**	**703**	**1,270**

* 1 to 1 spawning ratio, all males were spawned at least once.
** includes 365 fall releases, 62 Jan. escapees and 19 spring releases

Carcass Disposition	Males	Females	Total
Buried	372	451	823

* Age Class Breakdown: One-ocean (males ≤68 cm, females ≤66 cm)
Two-ocean (males ≥68 cm, females ≥66 cm)

SPRING CHINOOK SALMON BROOD YEAR 1997

Fish Trapped

	Total	Hat	Wild
Jacks	54	46	8
Males	11	6	5
Females	13	8	5
Total	**78**	**60**	**18**

Age Class Breakdown **

	Total	Hat	Wild
1-Ocean	54	46	8
2-Ocean	19	13	6
3-Ocean	5	1	4
Total	**78**	**60**	**18**

Fish Disposition	Males	Females	Total
Pre-spawn Mortality	1	1 (wild)	2
Shipped to Rapid River*	51	11	63

* Males include 46 jacks; 3 wild fish shipped after being captured and released 3 times

All pre-spawn mortalities were buried

** Age Class Breakdown: One-ocean (3-yr-olds, ≤53cm)
Two-ocean (4-yr-olds, 54-80cm)
Three-ocean (5-yr-olds, ≥81cm)

Appendix F. Snake River historic releases and returns data for Oxbow Fish Hatchery.

Year	Chinook Released	Steelhead Spring	Released Fall	Chinook Returns	Steelhead Returns
1966			29,400		
1967		587,513			1,681
1968		342,114			1,609
1969		109,200	757,500	344	1,122
1970		385,900	670,960		136
1971			215,625		279
1972			630,900	3	650
1973				2	435
1974				1	125
1975			40,977	14	34
1976			85,510		224
1977		126,000	301,644		243
1978			344,944		186
1979			548,987	1	36
1980		348,520	191,900		339
1981	1,003,200	614,160			158
1982		354,150			203
1983	250,020	92,750	220,270	16	872
1984	500,850	458,917	630,500	3	1,116
1985	437,360	414,712	387,353	699	1,343
1986	140,000	819,495	39,995	395	2,438
1987	547,700	800,000	672,235	543	3,209
1988	400,600	877,400	75,814	458	2,524
1989	500,000	735,500	603,000	84	2,729
1990	551,200	947,200	351,400	30	2,728
1991	500,500	912,000		22	1,151
1992	500,500	243,900		912	1,714
1993	200,300	660,500		431	1,259
1994	380,504	609,115		29	1,403
1995	499,986	614,560		36	1,597
1996	67,818	630,152		78	1,383
1997	13,470	660,651		944	1,270
1998	304,096	653,276		74	2,407

Submitted by:

Julia Rensel Hislop
Assistant Fish Hatchery Manager

Approved by:

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Virgil K. Moore, Chief
Fisheries Bureau

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Tom Rogers
Anadromous Fish Hatchery Manager